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FILE PLAN
2.0

Sampling QA/QC Work Plan

Richardson Flat Tailings

Prepared by
Ecology & Environment, Inc.

EPA Project No.: T08-9210-041
Contractor Work Order No.: EUT0039SCA
EPA Contract No.: 68-WO-0037

Approvals

Ecology & Environment, Inc.		EPA	
Scott Keen	11-2-92	Mike Zimmerman	10/29/92
Scott Keen Project Manager	Date	Mike Zimmerman On-Scene Coordinator	Date

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1.0 BACKGROUND

The suspected contamination at the Richardson Flat Tailings site (the Site) is a result of:

air migration of metals from tailings area; groundwater to surface water migration of contaminants from both the tailings and the landfill areas; and potential direct leaching from tailings or landfill to surface water.

The following information is known about the Site:

The Site is located 3.5 miles northeast of Park City, Summit County, Utah. From 1975 to 1981 the 160 acre site was used for placement of mine tailings from mines owned by United Park City Mines (UPCM). Tailings were placed at depths of up to ten feet. In 1983 UPCM began to use soil to cover the tailings. This is an on-going project which was eighty-five percent complete by UPCM estimates during the time of a site visit in April 1992. A security fence has been put in place surrounding the Site. Also on the Site is a municipal/sanitary landfill. This land was leased by UPCM to the city of Park City and was used for landfill purposes in the mid-1970s. In 1990 a highway was placed through the middle of the landfill creating two sections (one section of the landfill on each side of the highway). Refuse in the path of the highway was removed and placed on top of the undisturbed landfill sections and covered with soil.

The Site lies in a rural area with very widely scattered residences. It is within 1.5 miles of Prospector Square, a new residential community that supports Park City. Only three residences are within a one mile radius of the site.

The types of material(s) handled by this facility have been:

Mine Tailings
Municipal/Sanitary Refuse

The volume(s) of contaminated materials to be addressed are:

2 million tons - mine tailings
Unknown quantity - municipal/sanitary refuse

The contaminants of concern are:

Metals from the mine tailings
Metals, volatile organics, BNA's, and pesticides from the landfill.

The basis of this information may be found in:

Previous studies.

2.0 DATA USE OBJECTIVES

The objective of this project/sampling event is to determine:

Immediate threats to human health and/or the environment.

For the purpose of:

Assuring site safety preceding remedial activities.

The data gathered by this sampling event will be evaluated against:

State groundwater standards and quality criteria and background concentrations with the intent of establishing whether an immediate threat to human health or the environment exists and of defining appropriate cleanup levels, if necessary.

3.0 Quality Assurance Objectives

As identified in Sections 1.0 and 2.0 the objective of this project/event applies to the following parameters:

Parameters	Matrix	Intended Use Of Data	QA Objective
BNA, VOC, Pesticides, Metals	Groundwater	Determine Threat	QA-2

Note: The QA-2 level of quality assurance will meet the Level IV analytical objectives for remedial response activities as defined in OSWER Directive 9355.0-7B. For each sample matrix the CLP lab will be asked to perform a matrix spike/matrix spike duplicate analysis.

4.0 Approach And Sampling Methodologies

4.1 Sampling Equipment

The following equipment will be utilized to obtain environmental samples from the respective media/matrix:

Parameter/Matrix	Sampling Equipment	Fabrication	Dedicated
BNA in Groundwater	Bailer or Peristaltic pump	Teflon (PTFE) Tygon tubing	Yes Yes

Parameter/Matrix	Sampling Equipment	Fabrication	Dedicated
Inorganics in Groundwater	Bailer or Peristaltic pump	Teflon (PTFE) Tygon tubing	Yes Yes

Parameter/Matrix	Sampling Equipment	Fabrication	Dedicated
Pesticide in Groundwater	Bailer or Peristaltic pump	Teflon (PTFE) Tygon tubing	Yes Yes

Parameter/Matrix	Sampling Equipment	Fabrication	Dedicated
VOC in Groundwater	Bailer or Peristaltic pump	Teflon (PTFE) Tygon tubing	Yes Yes

4.2 Sampling Design

The sampling design is depicted on the attached Sample Location Map (Figure 2).

Landfill Assessment. One upgradient and two downgradient monitoring wells will be sampled to determine releases to groundwater from the municipal/sanitary landfill. Samples will be analyzed for base/neutral extractable compounds (BNAs), volatile organic compounds (VOCs), pesticides, and inorganics. Both unfiltered and filtered samples will be collected for inorganic/metals analyses.

The three monitoring wells to be sampled are designated RF-GW-01, RF-GW-02, and RF-GW-03. From each location an unfiltered and a filtered sample will be taken. The filtered sample will be submitted for metals analysis. The unfiltered sample will be analyzed for BNAs, VOCs, Pesticides/PCBs, and metals. One of the sample aliquots (filtered or unfiltered) for metals analysis will be collected in double volume. At one of the three locations triple volume sample will be collected for organics (BNAs, VOCs, Pesticides/PCBs) analyses. A trip blank will also be submitted for VOC analyses.

4.3 Standard Operating Procedures

4.3.1 Sample Documentation

All sample documents must be completed legibly, in ink. Any corrections or revisions must be made by lining through the incorrect entry and by initiating the error.

FIELD LOG BOOK

The Field Log Book is essentially a descriptive notebook detailing Site activities and observations so that an accurate account of field procedures can be reconstructed in the writer's absence. All entries should be dated and signed by the individuals making the entries, and should include (at a minimum) the following:

1. Site name and project number.
2. Name(s) of personnel on-site.
3. Dates and times of all entries (military time preferred).
4. Descriptions of all site activities, including site entry and exit times.
5. Noteworthy events and discussions.
6. Weather conditions.
7. Site observations.
8. Identification and description of samples and locations.
9. Subcontractor information and names of on-site personnel.
10. Date and time of sample collections, along with chain-of-custody information.
11. Record of photographs.
12. Site sketches.

SAMPLE LABELS

Sample labels must clearly identify the particular sample, and should include the following:

1. Site name and number.
2. Time sample was taken.
3. Sample preservation.
4. Initial of sampler(s).

Optional, but pertinent, information:

1. Analysis requested.
2. Sample location.

Sample labels must be securely affixed to the sample container. Tie-on labels can be used if properly secured.

CHAIN-OF-CUSTODY RECORD

A Chain-of-Custody record must be maintained from the time the sample is taken to its final deposition. Every transfer of custody must be noted and signed for, and a copy of this record kept by each individual who has signed. When samples (or groups of samples) are not under direct control of the individual responsible for them, they must be stored in a locked container sealed with a Chain-of-Custody seal.

The Chain-of-Custody record should include (at minimum) the following:

1. Sample identification number.
2. Sample information.
3. Sample location.
4. Sample date.
5. Name(s) and signature(s) of sampler(s).
6. Signature(s) of any individual(s) with control over samples.

CHAIN-OF-CUSTODY SEALS

Chain-of-Custody Seals demonstrate that a sample container has not been tampered with, or opened.

The individual in possession of the sample(s) must sign and date the seal, affixing it in such a manner that the container cannot be opened without breaking the seal. The name of this individual, along with a description of the sample packaging, must be noted in the Field Logbook.

4.3.2 Sampling SOPs

Sampling SOPs from the USEPA Emergency Response Branch Region VIII Quality Assurance Project Plan will be followed. Sample "splits" for all samples will be available to UPCM and to the State of Utah upon request.

GROUNDWATER WELL SAMPLING

Prior to sampling a well, the well will be purged. For this project, this will be accomplished with a bailer or a peristaltic pump. Purge water will be placed back in the well or will be poured on the ground near the well from which it came, following sampling.

Brush off well cap prior to opening, unlock and open well cap. A photoionization detector (HNU) or flame ionization detector (OVA) will be used on the escaping gases to determine the need for respiratory protection. Using a decontaminated water level indicator, the water level will be measured. Total depth of the well will be obtained with a depth sounder and the volume of water in the well will be calculated.

Three well volumes at a minimum should be purged if possible. Equipment must be decontaminated prior to use and between wells if dedicated equipment is not used.

Once purging is completed and the correct laboratory-cleaned sample jars and/or vials have been prepared, sampling will proceed. The sampling device (which may or may not be the same as the purging device) has been selected so as to not affect the integrity of the sample. Sampling will occur in a progression from the least to most contaminated well, if known.

The water sample may be collected using a teflon or stainless steel bailer. The bailer will be attached to a clean, dedicated, nylon rope and introduced into the well. The bailer will be lowered to the approximate mid-point of the screened interval. Once the sample is collected, care will be taken not to unduly agitate or aerate the water while pouring into the appropriate sample containers. Also, water samples may be collected by means of a peristaltic pump equiped with disposable tygon tubing. The tubing would be lowered into the mid point of the water column where a sample would be collected.

Measure the conductivity, temperature, and pH of the groundwater in a separate container. Record all field measurements on the field data sheets and in the field notebook.

4.3.3 Sample Handling and Shipment

Each of the sample bottles will be sealed and labeled according to the following protocol. Caps will be secured with custody seals. Bottle labels will contain all required information including sample number, time and date of collection, analysis requested, and preservative used. Sealed bottles will be placed in large metal or plastic coolers, and padded with an absorbent material such as vermiculite.

All sample documents will be affixed to the underside of each cooler lid. The lid will be sealed and affixed on at least two sides with EPA custody seals so that any sign of tampering is easily visible.

4.3.4 Decontamination Procedures

Decontamination procedures will also follow those described in the USEPA Region VIII Emergence Response Branch Quality Assurance Project Plan.

Groundwater Sampling. Bailers will be dedicated Teflon equipment. New braided nylon cord will be used at each monitoring well for bailing. Samples will be taken directly from bailers, thus decontamination steps will not be required. If a peristaltic pump is used, the tygon tubing used at each well will be dedicated to that well. Therefore decontamination steps will not be required.

4.4 Schedule of Activities

Table 1: Proposed Schedule of Work

Activity	Start Date	End Date
Groundwater Sampling	11/9/92	11/11/92
Sample Shipment	11/11/92	11/11/92

5.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The EPA On-Scene Coordinator, Mike Zimmerman, will provide overall direction to Ecology & Environment, Inc. staff concerning project sampling needs, objectives and schedule. Ecology & Environment, Inc. is under contract to provide technical assistance to the Emergency Response Branch of the U.S. EPA in Region VIII.

The Ecology & Environment, Inc. Project Manager, Scott Keen, is the primary point of contact with the EPA On-Scene Coordinator. The Project Manager is responsible for the development and completion of the Sampling QA/QC Plan, project team organization, and supervision of all project tasks, including reporting and deliverables. The Project Manager and the Field Manager are responsible for ensuring field adherence to the Sampling QA/QC Plan and recording any deviations. The Site QC Coordinator is also the primary project team contact with the lab.

The following personnel will work on this project:

Personnel	Responsibility
Scott Keen	Project Manager
Cordel Schmidt	Field Manager, Sampler
Troy Sanders	Sampler, Health and Safety Officer

The following laboratories will be providing the following analyses:

Lab Name / Location	Lab Type	Parameters
Unknown	CLP	BNAs, VOCs, Pesticides
Unknown	CLP	Metals

6.0 QUALITY ASSURANCE REQUIREMENTS

The following requirements apply to the respective QA Objectives and parameters identified in Section 3.0:

The following QA Protocols for QA-2 data are applicable to all sample matrices and include:

1. Provide sample documentation in the form of field logbooks, the appropriate field data sheets and chain of custody forms. Chain of custody sheets are optional for field screening locations.

2. All instrument calibration and/or performance check procedures/methods will be summarized and documented in the field/personal or instrument log notebook.

3. The detection limit will be determined and recorded, along with the data, where appropriate.

4. Document sample holding times; this includes documentation of sample collection and analysis dates.

5. Provide initial and continuing instrument calibration data.

6a. For soil, sediment and water samples, include rinsate blanks and trip blanks.

6b. For air samples, include lot blanks, field blanks, co-located samples, blind spikes, breakthrough, and surrogate/matrix spikes.

7. Performance Evaluation samples are optional, if available.

8. One of the following three options will be selected:

1. Definitive identification (choose one):

a. Screened data - confirm the identification of analytes via an EPA-approved method different from the screening method (field or lab) on at least 10% of the preliminary screened samples collected; provide documentation such as gas chromatograms, mass spectra, etc.
b. Unscreened data - confirm the identification of analytes via an EPA-approved method on all unscreened environmental samples; provide documentation such as gas chromatograms, mass spectra, etc.

2. Non-definitive quantitation (choose one):

a. Screened data - provide documentation of quantitative results from both the screening method and the EPA verification method.

b. Unscreened data - provide documentation of quantitative results.

3. Definitive quantitation/analytical error (choose one):

a. Screened data - determine the analytical error by calculating the precision, accuracy, and coefficient of variation by preparing and analyzing eight (8) QA replicates from the subset of samples used to verify screening results using an EPA-approved method.

b. Unscreened data - determine the analytical effort by calculating the precision, accuracy, and coefficient of variation by preparing and analyzing eight (8) samples analyzed using an EPA-approved method.

7.0 DELIVERABLES

The Ecology & Environment, Inc. Task Leader, Scott Keen, will maintain contact with the EPA On-Scene Coordinator, Mike Zimmerman, to keep him informed about the technical and financial progress of this project. This communication will commence with the issuance of the work assignment and project scoping meeting. Activities under this project will be reported in status and trip reports and other deliverables (e.g., analytical reports, final reports) described herein. Activities will also be summarized in appropriate format for inclusion in monthly and

annual reports.

Analytical Report

An analytical report will be prepared for samples analyzed under this plan. Information regarding the analytical methods/procedures employed, sample results, QA/QC results,chain-of-custody documentation, laboratory correspondence,and raw data will be provided within this deliverable.

Final Report

A final report will be prepared to correlate available background information with data generated under this sampling event and identify supportable conclusions and recommendations which satisfy the objectives of this sampling QA/QC plan.

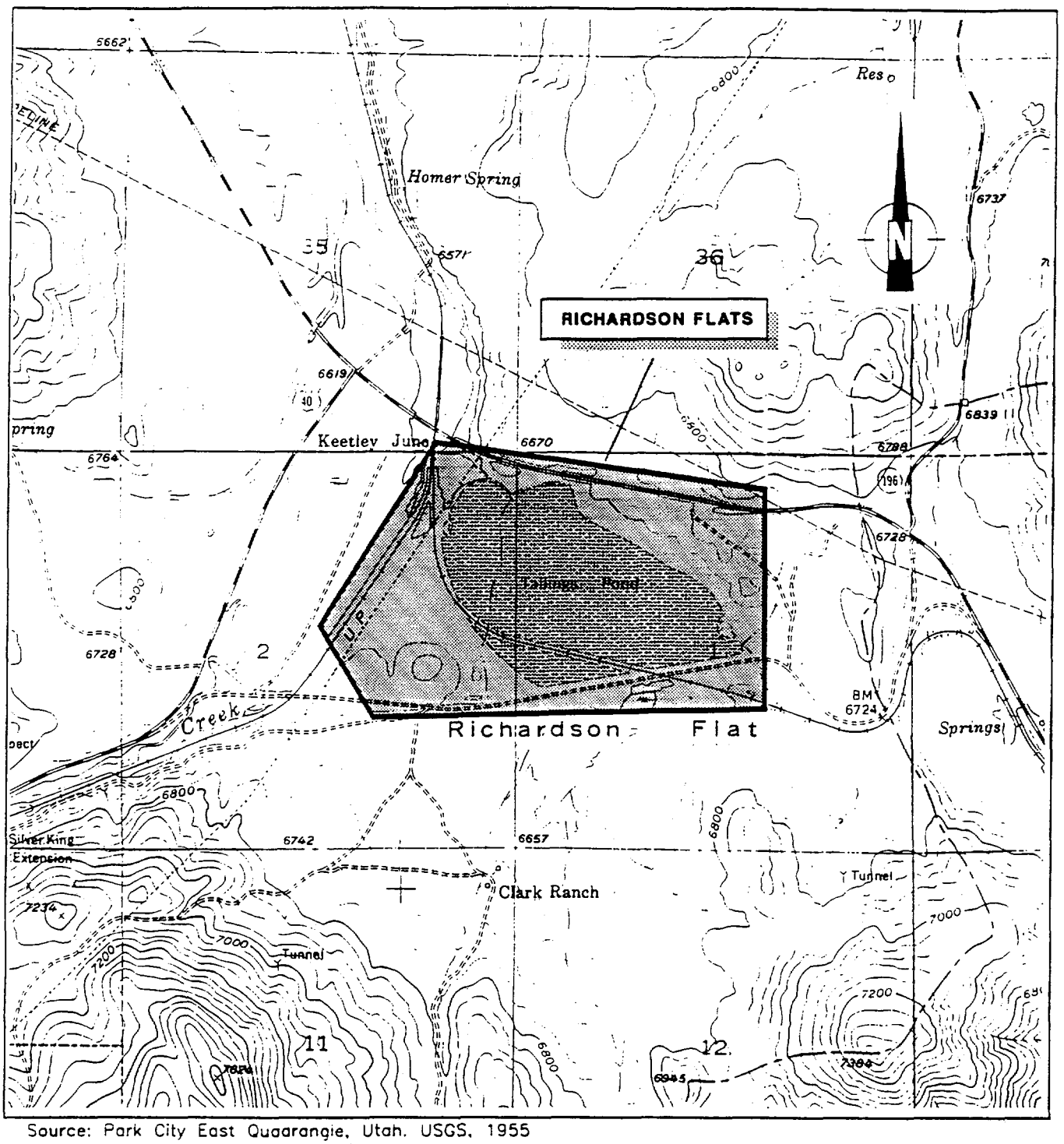
8.0 DATA VALIDATION

QA 2

Data generated under this QA/QC Sampling Plan will be evaluated accordingly with appropriate criteria contained in the Removal Program Data Validation Procedures which accompany OSWER Directive #9360.4-1.

Specific data review activities for QA 2 should be performed by the following approach:

1. Of the samples collected in the field, 10% will be confirmed for identification, precision, accuracy, and error determination.
2. The results of 10% of the samples in the analytical data packages should be evaluated for holding times, blank contamination, spike (surrogate/matrix) recovery, and detection capability.
3. The holding times, blank contamination, and detection capability will be reviewed for the remaining samples.



Source: Park City East Quaarangle, Utah. USGS, 1955

0 1/2 1 MILE

1000 0 1000 2000 3000 4000 5000

LOCATION MAP

LEGEND

Site location

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION
EPA CONTRACT 68-WO-0037

TITLE:

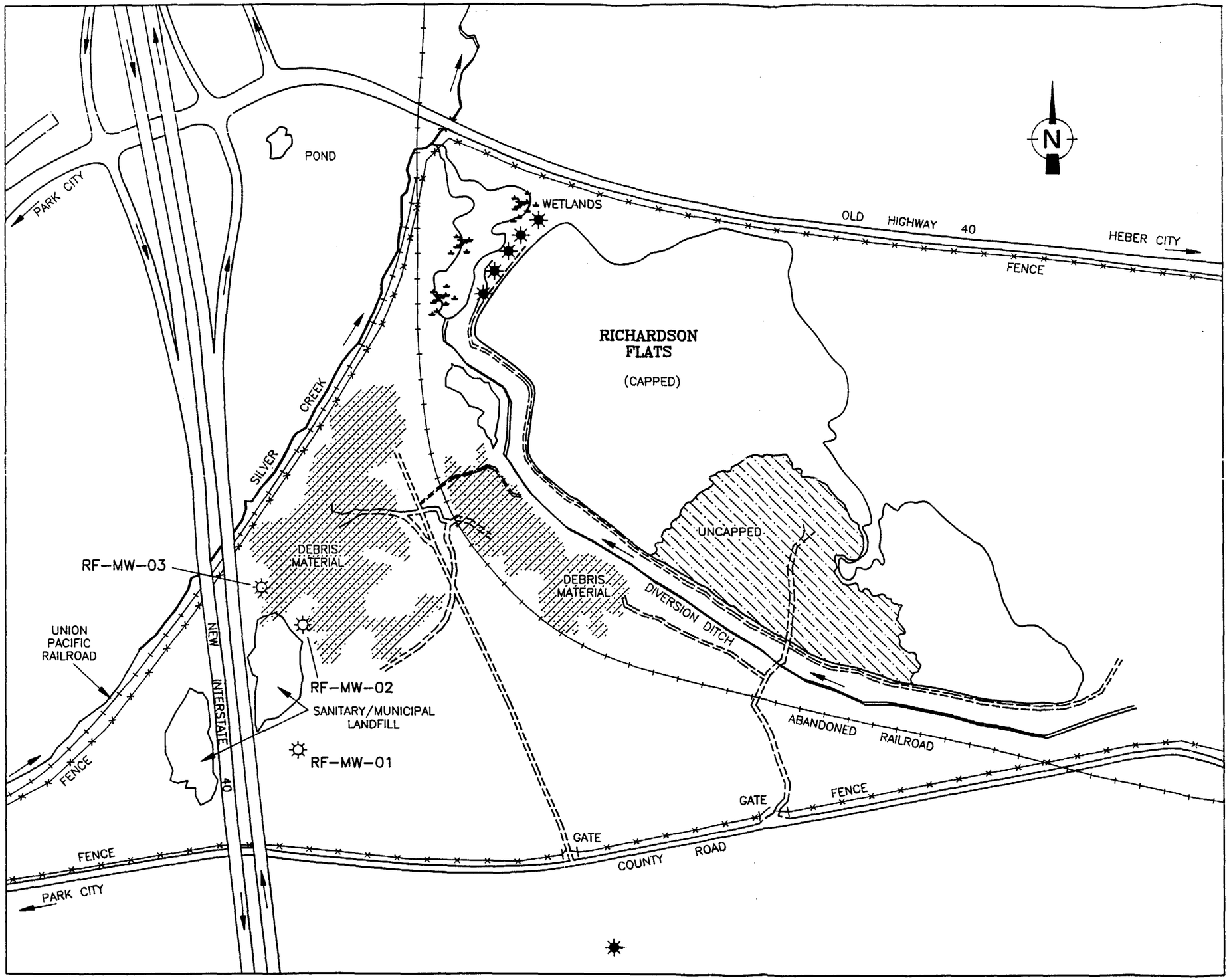
RICHARDSON FLATS
Park City, Utah
SITE LOCATION MAP

T.D.D. T08-9204-015

ecology & environment, inc.
DENVER, COLORADO

FIG. 1

Date: 05/92 Drawn by: RSM Scale:



LEGEND

- Approximate location of existing monitoring wells previously installed
- Location of existing monitoring wells installed 06/23/92 to 06/26/92

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION
EPA CONTRACT 68-WO-0037

TITLE:
RICHARDSON FLATS
Park City, Utah
MONITORING WELL LOCATION MAP

T.D.D. T08-9204-015

ecology & environment, inc.
DENVER, COLORADO

FIG. 2

Date: 07/92 Drawn by: RSM Scale:

FIGURE 3

TARGET COMPOUND LIST (TCL) AND

CONTRACT REQUIRED QUANTITATION LIMITS (CROL)*

	Volatiles	CAS Number	Quantitation Limits** Water Low ug/L	Soil/Sediment a ug/Kg
1.	Chloromethane	74-87-3	10	10
2.	Bromomethane	74-83-9	10	10
3.	Vinyl Chloride	75-01-4	10	10
4.	Chloroethane	75-00-3	10	10
5.	Methylene Chloride	75-09-2	5	5
6.	Acetone	67-64-1	10	10
7.	Carbon Disulfide	75-15-0	5	5
8.	1,1-Dichloroethane	75-35-4	5	5
9.	1,1-Dichloroethane	75-34-3	5	5
10.	1,2-Dichloroethane (total)	540-59-0	5	5
11.	Chloroform	67-66-3	5	5
12.	1,2-Dichloroethane	107-06-2	5	5
13.	2-Butanone	78-93-3	10	10
14.	1,1,1-Trichloroethane	71-55-6	5	5
15.	Carbon Tetrachloride	56-23-5	5	5
16.	Vinyl Acetate	108-05-4	10	10
17.	Bromodichloromethane	75-27-4	5	5
18.	1,2-Dichloropropene	78-87-5	5	5
19.	cis-1,3-Dichloropropene	10061-01-5	5	5
20.	Trichloroethene	79-01-6	5	5
21.	Dibromochloromethane	124-48-1	5	5
22.	1,1,2-Trichloroethane	79-00-5	5	5
23.	Benzene	71-43-2	5	5
24.	trans-1,3-Dichloropropene	10061-02-6	5	5
25.	Bromoform	75-25-2	5	5
26.	4-Methyl-2-pentanone	108-10-1	10	10
27.	2-Hexanone	591-78-6	10	10
28.	Tetrachloroethane	127-18-4	5	5
29.	Toluene	108-88-3	5	5
30.	1,1,2,2-Tetrachloroethane	79-34-5	5	5
31.	Chlorobenzene	108-90-7	5	5
32.	Ethyl Benzene	100-41-4	5	5
33.	Styrene	100-42-5	5	5
34.	Xylenes (total)	1330-20-7	5	5

a Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Volatile TCL Compounds are 125 times the individual Low Soil/Sediment CRQL.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

Semivolatiles		CAS Number	Quantitation Limits** Water Low ug/L	Soil/Sediment ug/Kg
35.	Phenol	108-95-2	10	330
36.	bis (2-Chloroethyl) ether	111-44-4	10	330
37.	2-Chlorophenol	95-57-8	10	330
38.	1,3-Dichlorobenzene	541-73-1	10	330
39.	1,4-Dichlorobenzene	106-46-7	10	330
40.	Benzyl alcohol	100-51-6	10	330
41.	1,2-Dichlorobenzene	95-50-1	10	330
42.	2-Methylphenol	95-48-7	10	330
43.	bis (2-Chloroisopropyl) ether	108-60-1	10	330
44.	4-Methylphenol	106-44-5	10	330
45.	N-Nitroso-di-n-dipropylamine	621-64-7	10	330
46.	Hexachloroethane	67-72-1	10	330
47.	Nitrobenzene	98-95-3	10	330
48.	Isophorone	78-59-1	10	330
49.	2-Nitrophenol	88-75-5	10	330
50.	2,4-Dimethylphenol	105-67-9	10	330
51.	Benzoic acid	65-85-0	50	1600
52.	bis (2-Chloroethoxy) methane	111-91-1	10	330
53.	2,4-Dichlorophenol	120-83-2	10	330
54.	1,2,4-Trichlorobenzene	120-82-1	10	330
55.	Naphthalene	91-20-3	10	330
56.	4-Chloroaniline	106-47-8	10	330
57.	Hexachlorobutadiene	87-68-3	10	330
58.	4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10	330
59.	2-Methylnaphthalene	91-57-6	10	330
60.	Hexachlorocyclopentadiene	77-47-4	10	330
61.	2,4,6-Trichlorophenol	88-06-2	10	330
62.	2,4,5-Trichlorophenol	95-95-4	50	1600
63.	2-Chloronaphthalene	91-58-7	10	330
64.	2-Nitroaniline	88-74-4	50	1600
65.	Dimethylphthalate	131-11-3	10	330
66.	Acenaphthylene	208-96-8	10	330
67.	2,6-Dinitrotoluene	606-20-2	10	330
68.	3-Nitroaniline	99-09-2	50	1600
69.	Acenaphthene	83-32-9	10	330

70.	2,4-Dinitrophenol	51-28-5	50	1600
71.	4-Nitrophenol	100-02-7	50	1600
72.	Dibenzofuran	132-64-9	10	330
73.	2,4-Dinitroroluene	121-14-2	10	330
74.	Diethylphthalate	84-66-2	10	330
75.	4-Chlorophenyl-phenyl ether	7005-72-3	10	330
76.	Fluorene	86-73-7	10	330
77.	4-Nitroaniline	100-01-6	50	1600
78.	4,6-Dinitro-2-methylphenol	534-52-1	50	1600
79.	N-nitrosodiphenylamine	86-30-6	10	330
80.	4-Bromophenyl-phenyl ether	101-55-3	10	330
81.	Hexachlorobenzene	118-74-1	10	330
82.	Pentachlorophenol	87-86-5	50	1600
83.	Phenanthrene	85-01-8	10	330
84.	Anthracene	120-12-7	10	330
85.	Di-n-butylphthalate	84-74-2	10	330
86.	Fluoranthene	206-44-0	10	330
87.	Pyrene	129-00-0	10	330
88.	Butylbenzylphthalate	85-68-7	10	330
89.	3,3-Dichlorobenzidine	91-94-1	20	660
90.	Benzo (a) anthracene	56-55-3	10	330
91.	Chrysene	218-01-9	10	330
92.	bis (2-Ethylhexyl) phthalate	117-81-7	10	330
93.	Di-n-octylphthalate	117-84-0	10	330
94.	Benzo (b) fluoranthene	205-99-2	10	330
95.	Benzo (k) fluoranthene	207-08-9	10	330
96.	Benzo (a) pyrene	50-32-8	10	330
97.	Indeno (1,2,3-cd) pyrene	193-39-5	10	330
98.	Dibenz (a,h) anthracene	53-70-3	10	330
99.	Benzo (g,h,i) perylene	191-24-2	10	330

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b Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Semivolatile TCL Compounds are 60 times the individual Low Soil/Sediment CRQL.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

Pesticides/PCBs		CAS Number	Quantitation Limits** Water ug/L	Low Soil/Sediment ug/Kg
100.	alpha-BHC	319-84-6	0.05	8.0
101.	beta-BHC	319-85-7	0.05	8.0
102.	delta-BHC	319-86-8	0.05	8.0
103.	gamma-BHC (Lindane)	58-89-9	0.05	8.0
104.	Heptaclor	76-44-8	0.05	8.0
105.	Aldrin	309-00-2	0.05	8.0
106.	Heptachlor epoxide	1024-57-3	0.05	8.0
107.	Endosulfan I	959-98-8	0.05	8.0
108.	Dieldrin	60-57-1	0.10	16.0
109.	4,4'-DDE	72-55-9	0.10	16.0
110.	Endrin	72-20-8	0.10	16.0
111.	Endosulfan II	33213-65-9	0.10	16.0
112.	4,4'-DDD	72-54-8	0.10	16.0
113.	Endosulfan sulfate	1031-07-8	0.10	16.0
114.	4,4'-DDT	50-29-3	0.10	16.0
115.	Methoxychlor	72-43-5	0.5	80.0
116.	Endrin ketone	53494-70-5	0.10	16.0
117.	alpha-Chlordane	5103-71-9	0.5	80.0
118.	gamma-Chlordane	5103-74-2	0.5	80.0
119.	Toxaphene	8001-35-2	1.0	160.0
120.	Aroclor-1016	12674-11-2	0.5	80.0
121.	Aroclor-1221	11104-28-2	0.5	80.0
122.	Aroclor-1232	11141-16-5	0.5	80.0
123.	Aroclor-1242	53469-29-6	0.5	80.0
124.	Aroclor-1248	12672-29-6	0.5	80.0
125.	Aroclor-1254	11097-69-1	1.0	160.0
126.	Aroclor-1260	11096-82-5	1.0	160.0

c Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Pesticides/PCB TCL compounds are 15 times the individual Low Soil/Sediment CRQL.

* Specific quantitation limits are highly matrix dependent. The

quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

INORGANIC TARGET ANALYTE LIST (TAL)

Analyte	Contract Required Detection Limit 1,2 (ug/L -- water*)
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	5
Magnesium	5000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5000
Selenium	5
Silver	10
Sodium	5000
Thallium	10
Vanadium	50
Zinc	20
Cyanide	10

1 Subject to the restrictions specified in the first page of Part G. Section IV of Exhibit D (Alternate Methods - Catastrophic Failure) any analytical method specified in SOW Exhibit D may be utilized as long as the documented instrument or method detection limits meet the Contract Required Detection Limit (CRDL) requirements. Higher detection limits may only be used in the following circumstances:

If the sample concentration exceeds five times the detection limit of the instrument or method in use, the value may be reported even

ecology and environment, inc.

SITE SAFETY PLAN

Version 988

A. GENERAL INFORMATION

Project Title: RICHARDSON FLAT TAILINGS SITE Project No.: ZT1081 EUT0039SBA

TDD/Pan No.: T08-9204-015

Project Manager: TROY SANDERS Project Dir.: TOM SMITH

Location(s): PARK CITY, UTAH

Prepared by: CORDEL SCHMIDT Date Prepared: 6-11-92

Approval by: RANDY PERLIS Date Approved: 6-11-92

Site Safety Officer Review: CORDEL SCHMIDT Date Reviewed: 6-11-92

Scope/Objective of Work: Drill and install three groundwater monitoring wells by means of a "casing drive drill rig".

Proposed Date of Field Activities: 6-22-92 through 6-26-92

Background Info: Complete: [X] Preliminary (No analytical data available) [ ]

Documentation/Summary:

Overall Chemical Hazard:	Serious [ ]	Moderate [X]
	Low [ ]	Unknown [ ]
Overall Physical Hazard	Serious [ ]	Moderate [X]
	Low [ ]	Unknown [ ]

B. SITE/WASTE CHARACTERISTICS

Waste Type(s):

Liquid	[X]	Solid	[X]	Sludge	[ ]	Gas/Vapor	[X]

Characteristic(s):

Flammable/ Ignitable	[X]	Volatile	[X]	Corrosive	[X]	Acutely Toxic	[X]
Explosive	[X]	Reactive	[X]	Carcinogen	[ ]	Radioactive*	[ ]

Other:

Physical Hazards:

Overhead	[X]	Confined* Space	[ ]	Below Grade	[ ]	Trip/Fall	[X]
Puncture	[ ]	Burn	[ ]	Cut	[X]	Splash	[X]
Noise	[X]	Other: Drilling rig operations					

*Requires completion of additional form and special approval from the Corporate Health/Safety group. Contact RSC or HQ.

T08-9204-015-004

Site History/Description and Unu .l Features (see Sampling Plan for deta. .d description): The Richardson Flat Tailings Site consists primarily of metal ore mill slurries and finely ground waste rock materials in a tailings pile which covers approximately 160 acres of the site. A sanitary landfill is also located within the site boundary.

Locations of Chemicals/Wastes: Wastes are located within the landfill and tailings site, of which the relative perimeter is known.

Estimated Volume of Chemicals/Wastes: Volume is unknown, however the site consists of approximately 160 acres.

Site Currently in Operation Yes: [ ] No: [x]

C. HAZARD EVALUATION

List Hazards by Task (i.e., drum sampling, drilling, etc.) and number them. (Task numbers are cross-referenced in Section D)

Physical Hazard Evaluation: Task #1: Monitoring well installation. Drill rig hazards, monitoring well installation hazards, trip/fall, noise, overhead hazards, heat stress, UV light, Interstate highway traffic and railroad traffic near site.

Chemical Hazard Evaluation:

Compound	PEL/TWA	Route of Exposure	Acute Symptoms	Odor Threshold	Odor Description
ARSENIC	.01 mg/m^3	ingest,derm,	vomit,spasims	none	---
LEAD	.05 mg/m^3	ingest,derm,	vomt,diareha	none	---
TCE	50 ppm	ingest,derm,	burn eyes,dizzy	5 ppm	solvent
VINYL CHLORIDE	5 ppm	ingest,contact	dzy,shrt breath	---	sweet
NITRIC ACID	2 ppm	ingest,dermal	eye/skin iritat	unknown	choking
SODIUM HYDROXIDE	2 mg/m^3	ingest,dermal	eye/skin iritat	odorless	---
NAPHTHALENE	10 ppm	ingest,dermal	nausea,headache	.04 ppm	mothballs
PCB	.5 mg/m^3	ingest,dermal	eye,skin,fatigue	---	---
METHANE	dpnd on O2 amt	inhale	asphyxiation	200 ppm (IMPURE)	none-sulfer like

Above contaminants are unconfirmed but are charecteristic of municipal landfills.

Note: Complete and attach a Hazard Evaluation Sheet for major known contaminant.

D. SITE SAFETY WORK PLAN

Site Control: Attach map, use back of this page, or sketch of site showing hot zone, contamination reduction, zone, etc.

Perimeter identified? [X] Site secured? [X]

Work Areas Designated? [X] Zone(s) of Contamination Identified? [X]

Personnel Protection (TLD badges required for all field personnel):

Anticipated Level of Protection (Cross-reference task numbers to Section C):

	A	B	C	D
Task 1			XX	XX
Task 2				
Task 3				
Task 4				
Task 5				
Task 6				

Modifications: IF CONDITIONS WARRENT AN UPGRADE TO LEVEL C THE SITE SAFETY OFFICER WILL DECIDE THE APPROPRIATE ACTION.

Action Levels for Evacuation of Work Zone Pending Reassessment of Conditions:

- Level D: O_2 <19.5% or >25%, explosive atmosphere >10% LEL, organic vapors above background levels, particulates >_____ mg/m^3, other >_____.
- Level C: O_2 <19.5% or >25%, explosive atmosphere >25% LEL_3(California-20%), unknown organic vapor (in breathing zone) >5 ppm, particulates >_____ mg/m^3, other >_____.
- Level B: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapors (in breathing zone) >500 ppm, particulates >_____ mg/m^3, other >_____.
- Level A: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapors >500 ppm, particulates >_____ mg/m^3, other >_____.

Air Monitoring (daily calibration unless otherwise noted):

Contaminant of Interest	Type of Sample (area, personal)	Monitoring Equipment	Frequency of Sampling
Volatile organics	Area	OVA	Continuous
Methane	Area	OVA/Explosimetr	Continuous

Decontamination Solutions and Procedures for Equipment, Sampling Gear, etc.:

The decontamination process for drilling equipment shall consist of: 1) A high pressure hot water and detergent cleaning and 2) A high pressure hot water rinse. Drilling bits, center rods, and temporary steel casing will also be rinsed with hexane or acetone and then rinsed with clean water. All PPE will be disposed of.

Personnel Decon Protocol: Boots and gloves will be soap water washed and rinsed water rinsed. All PPE will be dedicated and disposed of.

Decon Solution Monitoring Procedures, if Applicable: Monitor with HNU or OVA, change as necessary.

Special Site Equipment, Facilities, or Procedures (Sanitary Facilities and Lighting Must Meet 29 CFR 1910.120):

Underground utilities will be identified prior to mobilization onsite. Overhead power lines will be greater than 25 feet from the drill rig.

Site Entry Procedures and Special Considerations: Use usual site entry procedures (i.e. Access points, notify site safety officer when entering/exiting site). Initial site entry will also be made in level D PPE.

Work Limitations (time of day, weather conditions, etc.) and Heat/Cold Stress Requirements:

Drilling operations will occur during daylight hours only. No drilling will be done during thunderstorms or other extreem weather conditions.

General Spill Control, if applicable: Containment and collection.

Investigation-Derived Material Disposal (i.e., expendables, decon waste, cuttings):

Contaminated materials will be containerized and left on site.

Sample Handling Procedures Including Protective Wear:

Tyvek and "surgie" latex gloves will be worn during drilling (level D), if upgrade to level C; saranax, nitrile gloves, and full face respirators outfitted with GMC-H cartridges will be worn.

Team Member*	Responsibility
TROY SANDERS	Team Leader
CORDEL SCHMIDT	Site Safety Officer

*All entries into exclusion zone require Buddy System use. All E & E field staff participate in medical monitoring program and have completed applicable training per 29 CFR 1910.120. Respiratory protection program meets requirements of 29 CFR 1910.134, and ANSI Z88.2 (1980).

E. EMERGENCY INFORMATION

(Use supplemental sheets, if necessary)

LOCAL RESOURCES

(Obtain a local telephone book from your hotel, if possible)

Ambulance 911 or 262-6199

Hospital Emergency Room 350-4630 Holy Cross Hospital 1045 E, 100 S, SLC

Poison Control Center (801)581-2151

Police (include local, county sheriff, state) 911 or 649-9361

Fire Department 911

Airport Salt Lake City International (801)328-8996

Agency Contact (EPA, State, Local USCG, etc.) U.S. E.P.A.- Mike Zimmerman (303)294-7134

Local Laboratory N/A

UPS/Fed. Express 1-800-238-5355

Client/EPA Contact Mike Zimmerman (303) 294-7134

Site Contact

SITE RESOURCES

Site Emergency Evacuation Alarm Method Three blasts on vehicle horn.

Water Supply Source Local Motel

Telephone Location, Number TAT mobile phone 478-3873

Cellular Phone, if available 478-3873

Radio

Other

EMERGENCY CONTACTS

1. Dr. Raymond Harbison (Univ. of Florida) ..... (501) 221-0465 or (904) 462-3277, 3281
   Alachua, Florida (501) 370-8263 (24 hours)

2. Ecology and Environment, Inc., Safety Director
   Paul Jonmaire ..... (716) 684-8060 (office)
   (716) 655-1260 (home)

3. Regional Office Contact ..... (303)755-5231 (home)

   c/o Tom Smith-TATL (303)757-4984 (office)

4. TATOM, or Office Manager (G. Crockett)..... (303)290-9611 (home)

MEDTOX HOTLINE

1. Twenty-four hour answering service: (501) 370-8263

   What to report:

   - State: "this is an emergency."
   - Your name, region, and site.
   - Telephone number to reach you.
   - Your location.
   - Name of person injured or exposed.
   - Nature of emergency.
   - Action taken.

2. A toxicologist, (Drs. Raymond Harbison or associate) will contact you. Repeat the information given to the answering service.

3. If a toxicologist does not return your call within 15 minutes, call the following persons in order until contact is made:

   a. **24 hour hotline - (716) 684-8940**
   b. Corporate Safety Director - Paul Jonmaire - home # (716) 655-1260
   c. Assistant Corp. Safety Officer - Steven Sherman - home # (716) 688-0084

EMERGENCY ROUTES

(NOTE: Field Team must Know Route(s) Prior to Start of Work)

Directions to hospital (include map) West on Interstate 80 to Foothill Blvd. (Route 186), turn right (north) and proceed to 1100 E., turn right (north) and proceed to 100 S., turn left to Holy Cross Hospital, 1045 E., 100 S., Salt Lake City.

Emergency Egress Routes to Get Off-Site *Convene to command post for departure from site.*

F. EQUIPMENT CHECKLIST

PROTECTIVE GEAR

Level A	No.	Level B	No.
SCBA	>	SCBA	>
SPARE AIR TANKS	>	SPARE AIR TANKS	>
ENCAPSULATING SUIT (Type >_____)	>	PROTECTIVE COVERALL (Type >_____)	>
SURGICAL GLOVES	>	RAIN SUIT	>
NEOPRENE SAFETY BOOTS	>	BUTYL APRON	>
BOOTIES	>	SURGICAL GLOVES	>
GLOVES (Type >_____)	>	GLOVES (Type >_____)	>
OUTER WORK GLOVES	>	OUTER WORK GLOVES	>
HARD HAT	>	NEOPRENE SAFETY BOOTS	>
CASCADE SYSTEM	>	BOOTIES	>
5-MINUTE ESCAPE COOLING VEST	>	HARD HAT WITH FACE SHIELD	>
		CASCADE SYSTEM	>
		MANIFOLD SYSTEM	>
Level C		Level D	
ULTRA-TWIN RESPIRATOR	1 ea	ULTRA-TWIN RESPIRATOR (Available)	
POWER AIR PURIFYING RESPIRATOR		CARTRIDGES (Type _____)	
CARTRIDGES (Type GMC-H)	1 case	5-MINUTE ESCAPE MASK (Available)	
5-MINUTE ESCAPE MASK		PROTECTIVE COVERALL (Type tyvek)	6
PROTECTIVE COVERALL (Type tyvek)	6	RAIN SUIT	4
RAIN SUIT	4	NEOPRENE SAFETY BONDS	
BUTYL APRON		BOOTIES	6 pr
SURGICAL GLOVES	1 box	WORK GLOVES	
GLOVES (Type neoprene)	6 pr	HARD HAT WITH FACE SHIELD	1 ea
OUTER WORK GLOVES		SAFETY GLASSES	1 ea
NEOPRENE SAFETY BOOTS			
HARD HAT WITH FACE SHIELD	1 ea		
BOOTIES	6 pr		
HARDHAT	1 ea		

INSTRUMENTATION	No.
OVA	1
THERMAL DESORBER	
O2/EXPLOSIMETER W/CAL. KIT	1
PHOTOVAC TIP	
HNu (Probe > _____)	1
MAGNETOMETER	
PIPE LOCATOR	
WEATHER STATION	
DRAEGER PUMP, TUBES _____	
BRUNTON COMPASS	
MONITOX CYANIDE	
HEAT STRESS MONITOR	
NOISE EQUIPMENT > _____	
PERSONAL SAMPLING PUMPS	
RADIATION EQUIPMENT	
DOCUMENTATION FORMS	
PORTABLE RATEMETER	
SCALER/RATEMETER	
NaI Probe	
ZnS Probe	
GM Pancake Probe	
GM Side Window Probe	
MICRO R METER	
ION CHAMBER	
ALERT DOSIMETER	
POCKET DOSIMETER	
TLD Badge	2
FIRST AID EQUIPMENT	
FIRST AID KIT	1 kit
OXYGEN ADMINISTRATOR	
STRETCHER	
PORTABLE EYE WASH	
BLOOD PRESSURE MONITOR	
FIRE EXTINGUISHER	

DECON EQUIPMENT	No.
WASH TUBS	2
BUCKETS	1
SCRUB BRUSHES	2
PRESSURIZED SPRAYER	1
DETERGENT (Type alconox)	1
SOLVENT (Type _____)	
PLASTIC SHEETING	
TARPS AND POLES	
TRASH BAGS	3
TRASH CANS	
MASKING TAPE	
DUCT TAPE	1 roll
PAPER TOWELS	1 box
FACE MASK	
FACE MASK SANITIZER	
FOLDING CHAIRS	
STEP LADDERS	
DISTILLED WATER	
SAMPLING EQUIPMENT	
8 OZ. BOTTLES	
HALF-GALLON BOTTLES	
VOA BOTTLES	
STRING	
HAND BAILERS	
THIEVING RODS WITH BULBS	
SPOONS	
KNIVES	
FILTER PAPER	
PERSONAL SAMPLING PUMP SUPPLIES	
Water Level Indicator	1

VAN EQUIPMENT	No.
TOOL KIT	
HYDRAULIC JACK	
LUG WRENCH	
TOW CHAIN	
VAN CHECK OUT	
Gas	
Oil	
Antifreeze	
Battery	
Windshield Wash	
Tire Pressure	
MISCELLANEOUS	
PITCHER PUMP	
SURVEYOR'S TAPE	
100 FIBERGLASS TAPE	
300 NYLON ROPE	
NYLON STRING	
SURVEYING FLAGS	
FILM	2 roll
Camera, 35mm	1
BUNG WRENCH	
SOIL AUGER	
PICK	
SHOVEL	
CATALYTIC HEATER	
PROPANE GAS	
BANNER TAPE	
SURVEYING METER STICK	
CHAINING PINS & RING	
TABLES	
WEATHER RADIO	
BINOCULARS	
MEGAPHONE	

MISCELLANEOUS (Cont.)	No.
SHIPPING EQUIPMENT	
COOLERS	2
PAINT CANS WITH LIDS, 7 CLIPS EACH	
VERMICULITE	
SHIPPING LABELS	
DOT LABELS: "DANGER"	
"UP"	
"INSIDE CONTAINER COMPLIES ..."	
"HAZARD GROUP"	
STRAPPING TAPE	2 roll
BOTTLE LABELS	
BAGGIES	
CUSTODY SEALS	1 roll
CHAIN-OF-CUSTODY FORMS	
FEDERAL EXPRESS FORMS	
CLEAR PACKING TAPE	

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ON-SITE SAFETY MEETING

Project Richardson Flat TDD No. T08-9204-015

Date _____ Time _____ PAN No. EUTO039SBA

Address Park City, Utah

Specific Location On site command post

Type of Work Drill and install three groundwater monitoring wells.

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment Minimum protection coveralls, hard hat, steel toe boots, gloves, safety glassess.

Chemical Hazards Specifics unknown. Suspect volatile organics, inorganics, methane gas. Monitor continuously.

Radiation Hazards None suspected.

Physical Hazards Observe drill rig exclusion zone. Be aware of drill rig "kill" switch location.

Emergency Procedures Return to command post (three blasts on vehicle horn).

Hospital/Clinic Holy Cross Hospital Telephone 350-4630

Hospital Address 1045 E., 100 S., Salt Lake City

Special Equipment _____

Other _____

Checklist

1. Emergency information reviewed? _____ and made familiar to all team members? _____
2. Route to nearest hospital driven? _____ and its location known to all team members? _____
3. Site safety plan readily available and its location known to all team members? _____

Meeting shall be attended by all personnel who will be working within the exclusion area. Daily informal update meetings will be held when site tasks and/or conditions change.

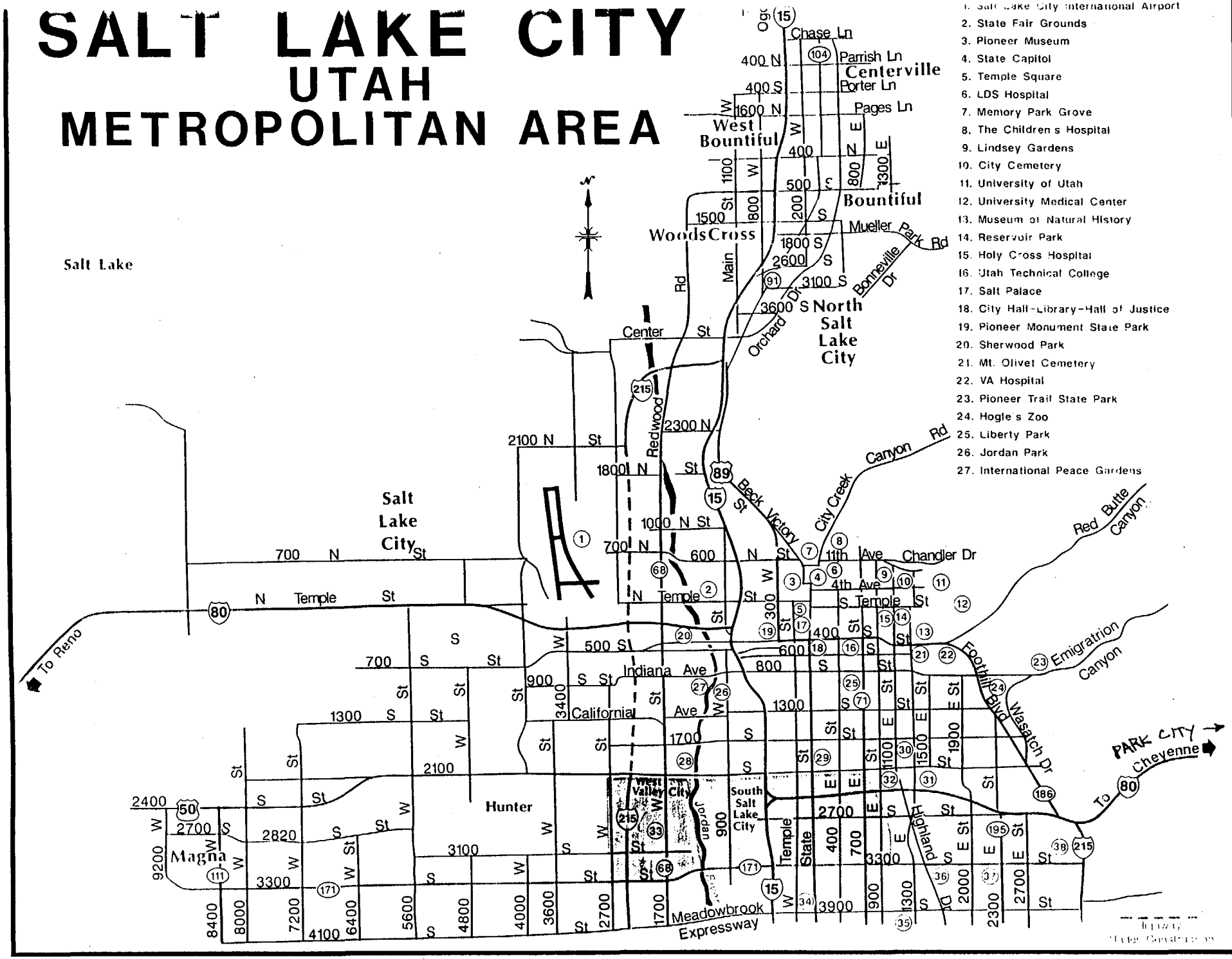
ATTENDEES

(Expand on back of sheet if necessary)

Name Printed	Signature
Troy Sanders	
Cordel Schmidt	

Meeting Conducted by: _____ (Print) _____ (Signature)

SALT LAKE CITY
UTAH
METROPOLITAN AREA



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Job No | HAZARD EVALUATION OF CHEMICALS | 9/18/90

Chemical Name: ARSENIC Preparation Date 5/9/90

CAS Number: 7440-38-2 DOT Name/UN No. ARSENICAL COMPOUND, SOLID, N.O.S., UN 1557

References Consulted:

XX NIOSH/OSHA Pocket Guide VERSCHUEREN MERCK INDEX HAZARDLINE XX ACGIH TOXIC & HAZARDOUS SAFETY MANUAL
CHRIS SAX Other SAX, ALDRICH

Chemical Properties:

Synonyms:

Chemical Formula As Molecular weight 74.9

Physical State BLACK SOLID Solubility (H20) INSOL Boiling Point SUBLIM

Flash Point Vapor Press/Density Freezing Point N/A IP & N/A

Odor Characteristic ODORLESS Flammable Limits N/A

Incompatabilities HALOGENS, OXIDIZERS, ZINC, BROMINE, AZIDE, AIR

Biological Properties:

IDLH TLV-TWA 0.2 MG/M3 PEL 10 UG/M3 Odor Threshold

Human ORAL Aquatic Rat/Mouse

Route of Exposure INHALATION, INGESTION, EYE

Carcinogen X Tetatogen Mutager

Handling Recommendations (Personal Protective Measures):

(100 UG/M3 USE APR; >UG/M3 USE SCBA; VITON, VINYL, NITRILE, NEOPRENE.

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

GET MEDICAL ATTENTION IMMEDIATELY; REMOVE TO FRESH AIR, ARTIFICIAL RESPIRATION IF NEEDED; FLUSH/ RINSE WITH LARGE AMOUNTS OF WATER FOR AT LEAST 15 MIN

Symptoms: Acute: ING-STOMACH DISTURBANCES, BURNING/DRY ORAL CAVATIES, VOMITING, SEVERE WEAKNESS, PERFORATION OF NASAL SEPTUM, IRRITATION OF RESPIRATORY TRACT, POSSIBLE SKIN IRRITATION

Chronic: INH-INDUSTRIAL CHRONIC POISIONING, FATIGUE, WEAKNESS, LOSS OF APPETITE, NAUSEAU, DIARRHEA, HORSENESS, UPPER RESP MUCOSA IRRITATION, ADVANCED STAGES SEE NERVE PROBLEMS IN EXTREMITIES, LIVER DAMAGE, LUNG CANCER, SKIN CANCER.

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Job No HAZARD EVALUATION OF CHEMICALS 3/10/90

Chemical Name: LEAD Preparation Dat [illegible]

CAS Number: 7439-92-1 DOT Name/UN No.

References Consulted:

XX NIOSH/OSHA Pocket Guide VERSCHUERAN MERCK INDEX XX HAZARDLINE XX ACGIH IIIC & HAZARDOUS SAFETY MANUAL XX CHRIS XX SAX Other ALDRICH, RTECS, SITTIG

Chemical Properties:

Synonyms: WHITE LEAD, PLUMBUM

Chemical Formula PB Molecular weight 207

Physical State VARIABLE Solubility (H20) INSOLUBLE Boiling Point 3164 F

Flash Point INCOMBUST Vapor Press/Density VARIABLE Freezing Point [illegible] P & 11.3

Odor Characteristic [illegible]amable Limits INCOMBUS

Incompatabilities STRONG OXIDIZERS, PERIOXIDES, ACTIVE METALS

Biological Properties:

IDLH VARIABLE TLV-TWA .15 MG/M3 PEL 50 MG/M3 Odor Thresnold NONE

Human Aquatic UNKNOWN Rat/Mose

Route of Exposure INHALATION, INGESTION, DERMAL CONTACT, EYE(OCULAR) DERMAL ABSORPTIO

Carcinogen INDEF Tetatogen EXP Mutage: INDEF

Handling Recommendations (Personal Protective Measures):

5 MG/M3 HIGH EFFICIENCY PARTICULATE RESPIRATOR, OTHER CONCENTRATIONS - SCBA, AVOID SKIN AND EYE CONTACT

Monitoring Recommendations:

Disposal/Waste Treatment:

TOXIC FUMES OF LEAD

Health Hazards and First Aid:

GIVE WATER, INDUCE VOMITING, MEDICAL ATTENTION IMMED, MOVE TO FRESH AIR, ARTIFICAL RESP IF NECESSARY, MEDICAL ATTENT, EYE/SKIN IRRIGATE/WASH WITH WATER, WASH SKIN THOROUGHLY WITH SOAP & WATER

Symptoms: Acute: CUMULATIVE NEUROTOXIN-COMMONLY OCCURS FROM PROLONGED EXPOSURE, SYMPTOMS INCLUDE STOMACH DISTRESS, VOMITING, DIARRHEA, BLACK STOOLS, ANEMIA, NERVOUS SYSTEM EFFECTS

Chronic: 3 CLINICAL TYPES A-AILMENTARY-ABOMINAL PAIN, DISCOMFORT, CONSTIPATION OR DIARRHEA, METALLIC TASTE, LEAD LINE ON GUM, HEADACHE, B-NUEROMUSCULAR, MUSCLE WEAKNESS, JOINT/MUSCLE PAIN, DIZZINESS, INSOMIA, PARALYSIS C-ENCEPHALIC BRAIN INVOLVEMENT, STUPOR, COMA, DEATH, RARE REPRODUCTIVE EFFECTS, HUMAN EPID STUDIES HAVE CONCLUDED THAT LEAD IS A POSION TO MALE & FEMALE GERM CELLS;INCREASED INCIDENCE OF

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Job No | HAZARD EVALUATION OF CHEMICALS | 8/10/90

Chemical Name: TRICHLOROETHYLENE Preparation Date [illegible]87

CAS Number: 79-01-6 DOT Name/UN No.

References Consulted:

XX NIOSH/OSHA Pocket Guide VERSCHUERAN MERCK INDEX HAZARDLINE XX ACGIH [illegible] & HAZARDOUS SAFETY MANUAL

XX CHRIS XX SAX Other ALDRICH, RTECS, SITTIG

Chemical Properties:

Synonyms: ICE, TRICHLORDETHENE, ETHYLENE TRICHLORIDE

Chemical Formula C2HCL3 Molecular weight 131

Physical State LIQUID Solubility (H20) INSOLUBLE Boiling Point 188 F

Flash Point NONE Vapor Press/Density 58 MM Freezing Point -123 F [illegible]46

Odor Characteristic [illegible]mble Limits 8-10.5%

Incompatabilities STRONG CAUSTICS, CHEMICALLY ACTIVEMETALS

Biological Properties:

IDLH TLV-TWA 50 PPM PEL 100 PPM Odor Threshold 50 PPM

Human 160 PPM/83MIN Aquatic 100-10 PPM Rat/Mous[illegible] PPM/4HR

Route of Exposure INHALATION, INGESTION, DERMAL CONTACT, EYE OCULAR

Carcinogen POS ANIM Tetatogen Mutager [illegible]

Handling Recommendations (Personal Protective Measures):

500 PPM APR W/ORGANIC CARTRIDGE; 1000 PPM-SCBA, EXCEL-VITON; GOOD-NEOPRENE/STYRENE; POO-[illegible], NEOPRENE, NITRILE

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

GIVE LARGE AMOUNTS OF WATER, INDUCE VOMITING, MEDICAL ATTENT, REMOVE TO FRESH AIR, CPR [illegible]ESSARY, MEDICAL ATTENT IMMED, IRRIGATE/FLUSH WITH WATER FOR AT LEAST 15 MIN, WASH SKIN THROUGHLY WITH SOAP AN[illegible]TER

Symptoms: Acute: IRRITATION OF NOSE & THROAT, NAUSEA, BLURRED VISION, IRRITATION TO EYE, [illegible]ATITIS

Chronic: LIVER AND/OR KIDNEY DAMAGE, CARDIAC DEGENERATION, CENTRAL NERVOUS SYSTEM [illegible]ENERATION

NITRIC ACID

NAC

Common Synonyms	Watery liquid	Colorless to light brown	Choking odor
	Sinks and mixes with water. Harmful vapor is produced.		

[illegible]
Wear chemical protective suit with self-contained breathing apparatus
[illegible]
Dike and remove discharged material
[illegible]

Fire

Not flammable.
May cause fire on contact with combustibles.
Flammable gas may be formed on contact with metals.
Poisonous gases are produced when heated.
Wear chemical protective suit with self-contained breathing apparatus.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Will burn eyes, nose and throat.
If inhaled, will cause difficult breathing or loss of consciousness.
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush exposed areas with plenty of water.
IN CASE OF CONTACT, immediately flush eyes with plenty of water for at least 15 minutes.
IF SWALLOWED and victim is conscious, give large quantities of water. Induce vomiting.
[illegible]
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.
Notify fire, health and water officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

- Issue warning-corrosive
- Restrict access
- Evacuate area
- Disperse and flush

2. LABEL

- **2.1 Category:** Oxidizer; Corrosive
- **2.2 Class:** 5 & 8

3. CHEMICAL DESIGNATIONS

- **3.1 CG Compatibility Class:** Nitric acid
- **3.2 Formula:** HNO_3-H_2O
- ***3.3 IMO/UN Designation:*** *8.0/2031*
- **3.4 DOT ID No.:** 2031
- **3.5 CAS Registry No.:** 7697-37-2

4. OBSERVABLE CHARACTERISTICS

- **4.1 Physical State (as shipped):** Liquid
- **4.2 Color:** Colorless
- ***4.3 Odor:*** *Acrid; sweet to acrid*

5. HEALTH HAZARDS

- **5.1 Personal Protective Equipment:** Air mask; rubber acid suit, hood, boots and gloves; chemical goggles; safety shower and eye bath.
- **5.2 Symptoms Following Exposure:** Vapors irritate eyes and respiratory tract; lung injury may not become apparent for several hours following exposure. Liquid may cause severe burns to eyes and skin.
- **5.3 Treatment of Exposure:** INHALATION: remove to fresh air, administer artificial respiration if required. INGESTION: drink large volumes of water; do NOT induce vomiting. SKIN OR EYES: flush with water for at least 15 min.
- **5.4 Threshold Limit Value:** 2 ppm
- **5.5 Short Term Inhalation Limits:** 15 ppm for 5 min.
- **5.6 Toxicity by Ingestion:** Grade 3; LD_{50} = 50 to 500 mg/kg
- **5.7 Late Toxicity:** None
- **5.8 Vapor (Gas) Irritant Characteristics:** 58-68%: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 95%: Vapors cause severe *irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at* low concentrations.
- **5.9 Liquid or Solid Irritant Characteristics:** Severe skin irritant. Causes second and third-degree *burns on short contact and is very injurious to the eyes.*
- **5.10 Odor Threshold:** Data not available
- **5.11 IDLH Value:** 100 ppm

6. FIRE HAZARDS

- **6.1 Flash Point:** Not flammable
- **6.2 Flammable Limits in Air:** Not flammable
- ***6.3 Fire Extinguishing Agents:*** *Use water on* adjacent fires.
- **6.4 Fire Extinguishing Agents Not to be Used:** *Not pertinent*
- **6.5 Special Hazards of Combustion Products:** May give off poisonous oxides of nitrogen and acid fumes when heated in fires.
- **6.6 Behavior in Fire:** Decomposes and gives off poisonous oxides of nitrogen.
- **6.7 Ignition Temperature:** Not flammable
- **6.8 Electrical Hazard:** Not pertinent
- **6.9 Burning Rate:** Not pertinent
- **6.10 Adiabatic Flame Temperature:** Data not available

(Continued)

7. CHEMICAL REACTIVITY

- **7.1 Reactivity With Water:** May heat up on mixing, but explosion or formation of steam unlikely.
- **7.2 Reactivity with Common Materials:** Very corrosive to wood, paper, cloth and most metals. Toxic red oxides of nitrogen are formed.
- **7.3 Stability During Transport:** When heated may give off toxic red oxides of nitrogen.
- **7.4 Neutralizing Agents for Acids and Caustics:** Flush with water
- **7.5 Polymerization:** Not pertinent
- **7.6 Inhibitor of Polymerization:** Not pertinent
- **7.7 Molar Ratio (Reactant to Product):** Data not available
- **7.8 Reactivity Group:** 3

8. WATER POLLUTION

- **8.1 Aquatic Toxicity:** 72 ppm/96 hr/mosquito fish/TL_m/fresh water
  330-1000 ppm/48 hr/cockle/LC_{50}/salt water
- ***8.2 Waterfowl Toxicity:*** *Data not available*
- **8.3 Biological Oxygen Demand (BOD):** None
- ***8.4 Food Chain Concentration Potential:*** None

9. SHIPPING INFORMATION

- **9.1 Grades of Purity:** Various grades: 52-98%
- **9.2 Storage Temperature:** Ambient
- **9.3 Inert Atmosphere:** No requirement
- **9.4 Venting:** Open or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-P

11. HAZARD CLASSIFICATIONS

- **11.1 Code of Federal Regulations:** Oxidizer
- **11.2 NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	3
Liquid or Solid Irritant	4
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	0
Self Reaction	0

- **11.3 NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0
	oxy

12. PHYSICAL AND CHEMICAL PROPERTIES

- **12.1 Physical State at 15°C and 1 atm:** Liquid
- **12.2 Molecular Weight:** Not pertinent
- **12.3 Boiling Point at 1 atm:** 192.0°F = 88.9°C = 362.1°K
- **12.4 Freezing Point:** —50°F = —45.6°C = 227.6°K
- **12.5 Critical Temperature:** Not pertinent
- **12.6 Critical Pressure:** Not pertinent
- **12.7 Specific Gravity:** *1.49 at 20°C (liquid)*
- **12.8 Liquid Surface Tension:** Not pertinent
- **12.9 Liquid Water Interfacial Tension:** *Not pertinent*
- **12.10 Vapor (Gas) Specific Gravity:** Not pertinent
- ***12.11 Ratio of Specific Heats of Vapor (Gas):*** (est.) 1.248
- **12.12 Latent Heat of Vaporization:** *214 Btu/lb = 119 cal/g =* 4.98 X 10^5 J/kg
- **12.13 Heat of Combustion:** Not pertinent
- **12.14 Heat of Decomposition:** Not pertinent
- **12.15 Heat of Solution:** —205 Btu/lb = —114 cal/g = —4.76 X 10^5 J/kg
- **12.16 Heat of Polymerization:** Not pertinent
- **12.25 Heat of Fusion:** Data not available
- **12.26 Limiting Value:** Data not available
- **12.27 Reid Vapor Pressure:** 1.9 psia

6. FIRE HAZARDS (Continued)

- **6.11 Stoichiometric Air to Fuel Ratio:** Data not available
- **6.12 Flame Temperature:** Data not available

SODIUM HYDROXIDE

SHD

Common Synonyms	Solid flakes or pellets White Odorless
Caustic soda Lye	Sinks and mixes with water.

Avoid contact with solid and dust. Keep people away.
Wear rubber overclothing (including gloves).
Avoid discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
May cause fire on contact with combustibles.
Flammable gas may be produced on contact with metals.
Wear rubber overclothing (including gloves).
Flood discharge area with water.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

DUST
Irritating to eyes, nose and throat.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.
IF IN EYES, hold eyelids open and flush with plenty of water.

SOLID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-corrosive
Restrict access
Disperse and flush

2. LABEL

2.1 Category: Corrosive
2.2 Class: 8

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Not listed
3.2 Formula: NaOH
3.3 IMO/UN Designation: 8.0/1823
3.4 DOT ID No.: 1823
3.5 CAS Registry No.: 1310-73-2

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Solid
4.2 Color: White
4.3 Odor: Odorless

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Chemical safety goggles; face shield; filter or dust-type respirator; rubber boots; rubber gloves.
5.2 Symptoms Following Exposure: Strong corrosive action on contacted tissues. INHALATION: dust may cause damage to upper respiratory tract and lung itself, producing from mild nose irritation to pneumonitis. INGESTION: severe damage to mucous membranes; severe scar formation or perforation may occur. EYE CONTACT: produces severe damage.
5.3 Treatment of Exposure: INHALATION: remove from exposure; support respiration; call physician. INGESTION: give water or milk followed by dilute vinegar or fruit juice; do NOT induce vomiting. SKIN: wash immediately with large quantities of water under emergency safety shower while removing clothing; continue washing until medical help arrives; call physician. EYES: irrigate immediately with copious amounts of water for at least 15 min.; call physician.
5.4 Threshold Limit Value: 2 mg/m³
5.5 Short Term Inhalation Limits: Not pertinent
5.6 Toxicity by Ingestion: (10% solution) oral rabbit LD_{Lo} = 500 mg/kg
5.7 Late Toxicity: None
5.8 Vapor (Gas) Irritant Characteristics: Non-volatile
5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurous to the eyes.
5.10 Odor Threshold: Not pertinent
5.11 IDLH Value: 200 mg/m³

6. FIRE HAZARDS

6.1 Flash Point: Not flammable
6.2 Flammable Limits in Air: Not flammable
6.3 Fire Extinguishing Agents: Not pertinent
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: Not flammable
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not flammable
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: Dissolves with liberation of much heat; may steam and splatter
7.2 Reactivity with Common Materials: When wet, attacks metals such as aluminum, tin, lead, and zinc to produce flammable hydrogen gas.
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with dilute acetic acid
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent
7.7 Molar Ratio (Reactant to Product): Data not available
7.8 Reactivity Group: Data not available

8. WATER POLLUTION

8.1 Aquatic Toxicity: 125 ppm/96 hr/mosquito fish/TL_m/fresh
180 ppm/23 hr/oysters/lethal/salt water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): None
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Technical flakes; USP pellets
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

SS

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: Corrosive material
11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	1

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Solid
12.2 Molecular Weight: 40.00
12.3 Boiling Point at 1 atm: Very high
12.4 Freezing Point: 604°F = 318°C = 591°K
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 2.13 at 20°C (solid)
12.8 Liquid Surface Tension: Not pertinent
12.9 Liquid Water Interfacial Tension: Not pertinent
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
12.12 Latent Heat of Vaporization: Not pertinent
12.13 Heat of Combustion: Not pertinent
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: 50.0 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: Data not available

NOTES

JUNE 1985

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ecology and environment, inc.

Job No | HAZARD EVALUATION OF CHEMICALS | 8/10/90

Chemical Name: NAPHTHALENE Preparation Date: [illegible]-90

CAS Number: 91-20-3 DOT Name/UN No.

References Consulted:

XX NIOSH/OSHA Pocket Guide VERSCHUERAN MERCK INDEX XX HAZARDLINE XX ACGIH [illegible] & HAZARDOUS SAFETY MANUAL XX CHRIS XX SAX Other ALDRICH, SITTIG

Chemical Properties:

Synonyms: NAPTHALIN, MOTH BALL, WHITE TAR

Chemical Formula C10H8 Molecular weight

Physical State SOLID FLAKES Solubility (H20) INSOLUBLE Boiling Point 424 F

Flash Point 174 F Vapor Press/Density 05 MM Freezing Point 177 F [illegible] 3625

Odor Characteristic [illegible]mable Limits 03-59%

Incompatabilities STRONG OXIDIZERS, CHROMIC ANHYDRIDE

Biological Properties:

IDLH TLV-TWA 10 PPM PEL 10 PPM Odor Threshold 3 PPM

Human Aquatic 10-1 PPM Rat/Mous

Route of Exposure INHALATION, INGESTION, DERMAL CONTACT, EYE OCULAR, DERMAL ABSORPTIO

Carcinogen N/A Tetatogen Mutage[illegible]

Handling Recommendations (Personal Protective Measures):

500 PPM USE APR W/CHEMICAL CARTRIDGE; 500 PPM-SCBA, EXCEL-VITON;POOR-BUTYL, VINYL, NEOPRENE, NITRILE, PREVENT REPEATED/PROLONGED EXPOSURES

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

GET MEDICAL ATTENT IMMED, GIVE WATER & INDUCE VOMITING, MOVE TO FRESH AIR, CPR IF NECESSARY, MEDICAL ATTENT IMMED, IRRIGATE/RINSE WITH WATER FOR AT LEAST 15 MIN, WASH SKIN THROUGHLY WITH SOAP & WATER

Symptoms: Acute: SKIN SENSITIZER & BLOOD AGENT, EYE IRRITATION, HEADACHE, CONFUSION, [illegible]NAL PAIN, NAUSEA, VOMITING, DIARRHEA, BLADDER, IRRITATION, HEMOLYTIC EFFECTS (DESTRUCTION OF RED BLOOD CELLS) MOSTLY PRONOUNCED IN INDIVIDUALS W/HEREDITARY DEFICIENCY OF GLUCOSE-6-DEHYDROGENASE

Chronic: REPEATED EXPOSURE MAY CAUSE DERMATITIS, KIDNEY AND/OR LIVER DAMAGE, [illegible]ED EXPOSURE MAY LEAD TO CATARACTS

ecology and environment, inc.

Job No | HAZARD EVALUATION OF CHEMICALS | 9/10/90

Chemical Name: POLYCHLORINATED BIPHENYL Preparation Dat [illegible]

CAS Number: 53469-21-9 DOT Name/UN No.

References Consulted:

XX NIOSH/OSHA Pocket Guide VERSCHUERAN MERCK INDEX HAZARDLINE XX ACGIH [illegible] & HAZARDOUS SAFETY MANUAL

XX CHRIS XX SAX Other RTECS

Chemical Properties:

Synonyms: AROCHLOR 1242/42% CHLORINE, CHLORODIPHENYL PCB

Chemical Formula C12H7Cl3 Molecular weight 259

Physical State DARK LIQUID Solubility (H20) INSOLUBLE Boiling Point 617-691

Flash Point 349 F Vapor Press/Density 001 MM Freezing Point -2 F [illegible] 3 5.3

Odor Characteristic [illegible]mable Limits UNKNOWN

Incompatabilities STRONG OXIDIZERS

Biological Properties:

IDLH TLV-TWA 1 MG/M3 PEL 1 MG/M3 Odor Threshold

Human 10 MG/M3 Aquatic 278 PPM Rat/mouse

Route of Exposure INHALATION, INGESTION, DERMAL CONTACT EYE OCULAR, DERMAL ABSORPTION

Carcinogen SUS-HUM Tetatogen Mutage [illegible]-POS

Handling Recommendations (Personal Protective Measures):

ANY DETECTABLE LIMIT - SCBA, EXCEL-VITON;GOOD-BUTYL, VINYL, NITRILE; POOR-NEOPRENE, SAFETY GOGGLES, CLOTHING TO AVOID CONTACT

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

MEDICAL ATTEN IMMED, GIVE SALT WATER, INCUCE VOMITING, MOVE TO FRESH AIR, ARTIFICAL RESP IF NECESSARY, MEDICAL ATTEN, IRRIGATE/RINSE IMMED WITH WATER, WASH SKIN THROUGHLY WITH SOAP & WATER

Symptoms: Acute: IRRITATION OF EYES, NOSE, THROAT, CAN CAUSE VOMITING, EDEMA, ANOREXIA, NAUSEA, ABDOMINAL PAIN, FATIGUE

Chronic: CHLORACNE FROM PROLONGED SKIN CONTACT, ACUTE & CHRONIC EXPOSURE MAY CAUSE LIVER DAMAGE OR CANCER

METHANE

MTH

Common Synonyms	Gas	Colorless	Weak odor
Marsh gas Natural gas	Liquid floats and boils on water. Flammable visible vapor cloud is produced.		

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to "knock down" vapor.
Evacuate area in case of large discharge.
Avoid contact with liquid and vapor.
Notify local health and pollution control agencies.

Fire	FLAMMABLE. Flashback along vapor trail may occur. May explode if ignited in an enclosed area. Stop discharge if possible. Cool exposed containers and protect men effecting shutoff with water. Let fire burn.
Exposure	CALL FOR MEDICAL AID **VAPOR** Not irritating to eyes, nose or throat. If inhaled, will cause dizziness, difficult breathing, and loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. **LIQUID** Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS
Water Pollution	Not harmful to aquatic life.

1. RESPONSE TO DISCHARGE
(See Response Methods Handbook)

Issue warning-high flammability
Restrict access
Evacuate area

2. LABEL
2.1 Category: Flammable gas
2.2 Class: 2

3. CHEMICAL DESIGNATIONS
3.1 CG Compatibility Class: Paraffin
3.2 Formula: CH_4
3.3 IMO/UN Designation: 2.0/1971
3.4 DOT ID No.: 1971
3.5 CAS Registry No.: 74-82-8

4. OBSERVABLE CHARACTERISTICS
4.1 Physical State (as shipped): Liquefied gas
4.2 Color: Colorless
4.3 Odor: Mild, sweet

5. HEALTH HAZARDS
5.1 Personal Protective Equipment: Self-contained breathing apparatus for high concentrations; protective clothing if exposed to liquid.
5.2 Symptoms Following Exposure: High concentrations may cause asphyxiation. No systemic effects, even at 5% concentration in air.
5.3 Treatment of Exposure: Remove to fresh air. Support respiration.
5.4 Threshold Limit Value: Not pertinent (methane is an asphyxiant, and limiting factor is available oxygen)
5.5 Short Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Not pertinent
5.7 Late Toxicity: None
5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat.
5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin, because it evaporates quickly, but may cause some frostbite.
5.10 Odor Threshold: 200 ppm
5.11 IDLH Value: Data not available

6. FIRE HAZARDS
6.1 Flash Point: Flammable gas
6.2 Flammable Limits in Air: 5.0%-15.0%
6.3 Fire Extinguishing Agents: Stop flow of gas
6.4 Fire Extinguishing Agents Not to be Used: Water
6.5 Special Hazards of Combustion Products: None
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: 1004°F
6.8 Electrical Hazard: Class I, Group D
6.9 Burning Rate: 12.5 mm/min.
6.10 Adiabatic Flame Temperature: 2339. (Est.)
6.11 Stoichiometric Air to Fuel Ratio: 17.16 (Est.)
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY
7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent
7.7 Molar Ratio (Reactant to Product): Data not available
7.8 Reactivity Group: 31

8. WATER POLLUTION
8.1 Aquatic Toxicity: None
8.2 Waterfowl Toxicity: None
8.3 Biological Oxygen Demand (BOD): None
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION
9.1 Grades of Purity: Research grade; pure grade
9.2 Storage Temperature: -260°F
9.3 Inert Atmosphere: No requirement
9.4 Venting: Safety relief

10. HAZARD ASSESSMENT CODE
(See Hazard Assessment Handbook)

A-B-C-D-E-F-G

11. HAZARD CLASSIFICATIONS
11.1 Code of Federal Regulations: Flammable gas
11.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	4
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effect	0
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES
12.1 Physical State at 15°C and 1 atm: Gas
12.2 Molecular Weight: 16.04
12.3 Boiling Point at 1 atm: −258.7°F = −161.5°C = 111.7°K
12.4 Freezing Point: −296.5°F = −182.5°C = 90.7°K
12.5 Critical Temperature: −116.5°F = −82.5°C = 190.7°K
12.6 Critical Pressure: 668 psia = 45.44 atm = 4.60 MN/m^2
12.7 Specific Gravity: 0.422 at −160°C (liquid)
12.8 Liquid Surface Tension: 14 dynes/cm = 0.014 N/m at −161°C
12.9 Liquid Water Interfacial Tension: (est.) 50 dynes/cm = 0.050 N/m at −161°C
12.10 Vapor (Gas) Specific Gravity: 0.55 1.0
12.11 Ratio of Specific Heats of Vapor (Gas): 1.306
12.12 Latent Heat of Vaporization: 219.4 Btu/lb = 121.9 cal/g = 5.100 X 10^5 J/kg
12.13 Heat of Combustion: −21,517 Btu/lb = −11,954 cal/g = −500.2 X 10^5 J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: 13.96 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: Very high

NOTES

SCAN 18-1 HEAT-RELATED EMERGENCIES

Condition	*Muscle Cramps*	*Breathing*	*Pulse*	*Weakness*	*Skin*	*Perspiration*	*Loss of Consciousness*
Heat cramps	Yes	Varies	Varies	Yes	Moist-warm No change	Heavy	Seldom
Heat exhaustion	No	Rapid Shallow	Weak	Yes	Cold Clammy	Heavy	Sometimes
Heat-stroke	No	*Deep, then* shallow	*Full* Rapid	Yes	Dry-hot	Little *or* none	Often

1 HEAT CRAMPS

SYMPTOMS AND SIGNS:
Severe muscle cramps (usually in the legs and abdomen), exhaustion, sometimes dizziness or periods of faintness.

EMERGENCY CARE PROCEDURES:
- Move patient to a nearby cool place
- Give patient salted water to drink or half-strength commercial electrolyte fluids
- Massage the "cramped" muscle to help ease the patient's discomfort, massaging with pressure will be more effective than light rubbing actions. (Optional in some EMS systems).
- Apply moist towels to the patient's forehead and over cramped muscles for added relief
- If cramps persist, or if more serious signs and symptoms develop, ready the patient and transport

2 HEAT EXHAUSTION

SYMPTOMS AND SIGNS:
Rapid and shallow breathing, weak pulse, cold and clammy skin, heavy perspiration, total body weakness, and dizziness that sometimes leads to unconsciousness.

EMERGENCY CARE PROCEDURES:
- Move the patient to a nearby cool place.
- Keep the patient at rest.
- Remove enough clothing to cool the patient without chilling him (watch for shivering)
- Fan the patient's skin.
- Give the patient salted water or half-strength commercial electrolyte fluids. Do not try to administer fluids to an unconscious patient.
- Treat for shock, but do not cover to the point of overheating the patient.
- Provide oxygen if needed
- If unconscious, fails to recover rapidly, has other injuries, or has a history of medical problems, transport as soon as possible.

3 HEATSTROKE

SYMPTOMS AND SIGNS:
Deep breaths, then shallow breathing; rapid strong pulse, then rapid, weak pulse; dry, hot skin; dilated pupils; loss of consciousness (possible coma); seizures or muscular twitching may be seen.

EMERGENCY CARE PROCEDURES:
- Cool the patient—in any manner—rapidly, move the patient out of the sun or away from the heat source. Remove patient's clothing and wrap him in wet towels and sheets. Pour cool water over these wrappings. Body heat must be lowered rapidly or brain cells will die!
- Treat for shock and administer a high concentration of oxygen.
- If cold packs or ice bags are available, wrap them and place one bag or pack under each of the patients armpits, one behind each knee, one in the groin, one on each wrist and ankle, and one on each side of the patient's neck.
- Transport as soon as possible.
- Should transport be delayed, find a tub or container—immerse patient up to the face in cooled water. Constantly monitor to prevent drowning.
- Monitor vital signs throughout process.